City of Rocks Invasive Plant Inventory

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Summary of 2003 Activities

Project Summary

The University of Idaho, Invasive Plant Remote Sensing and Mapping Lab conducted an invasive plant inventory of City of Rocks located in southern Idaho during June of 2003. A temporary summer crew was trained to map and identify invasive plants. Two members of the crew had a taxonomy background. The crew used digital orthophotoquads and a shape file of areas requiring survey provided by NPS staff that were stored in Compaq IPAQ handheld computers equipped with a WAAS GPS. On-screen mapping of invasive plants was accomplished using ArcPad software running menus our lab designed to acquire data into data fields supplied by NPS. The inventory was conducted by spacing each crew member twice the distance from which the invasive species could be reliably detected. The crews focused on trails, campsites, roadways as the initial point for survey and then radiated out from these initial areas as plants were detected, continuing to survey for 0.25 miles past the last detected plant. The crew was searching for 14 species, and included Canada thistle, field bindweed, black henbane, musk thistle, poison hemlock, spotted knapweed, houndstongue, yellow toadflax, bull thistle, dyer's woad, Scotch thistle, salt cedar, chicory and wavyleaf thistle. Species found during the survey included: black henbane, bull thistle, Canada thistle, chicory, field bindweed, houndstongue, musk thistle, salt cedar, Scotch thistle, spotted knapweed, sulfur cinquefoil, and wavyleaf thistle. The crew surveyed a total of 790 acres and included all priority areas identified for survey. A total of 38 acres were infested with weeds of the 790 acres surveyed. Several species were limited in distribution with a total of less than 2 acres infested and would be inexpensive to eliminate if they are not found in other areas of the park in greater acreages. Species with less than two acres include: black henbane, chicory, houndstongue, musk thistle, Scotch thistle, spotted knapweed and wavyleaf thistle. Special attention should be paid to houndstongue and Scotch thistle. Other species had fewer than 10 acres and included bull thistle, field bindweed, salt cedar and sulfur cinquefoil. Of the species in this second category, salt cedar and sulfur cinquefoil both are species of concern and should be contained in the case of sulfur cinquefoil and a process of eradication begun for salt cedar.

Introduction

Strategic planning for invasive plant management is essential to decrease the total area infested, remove species of limited distribution and detect new invaders. An inventory of invasive species is fundamental to development of a strategic plan. The National Park Service, at City of Rocks began the process to develop a strategic plan with the initiation of an inventory. Concurrent with that inventory process should be initial action to begin control of infestations. This report will outline the methods employed to conduct the survey, summarize the findings and provide a brief outline of strategic planning rather than in-depth planning which is beyond the scope of the project.

In general, a strategic approach involves determining the extent of the problem by species, the location of the infestations with respect to sensitive features, location of infestation with respect to serving as a source for dispersal, the size of the infestation, and the potential for ecological modification by the species. Attention to these details will help formulate a strategy.

Methods

The invasive plant species selected for inventory were determined by NPS at City of Rocks. There were 12 species found and these species are listed in Table 1. Polygons detailing areas to focus survey efforts were also provided by NPS personnel. A priority ranking for areas to survey was developed jointly by us and NPS. A ranking was required because we knew that all areas slated for inventory could not be inventoried with the resources allocated.

Background digital orthophoto quadrangles were obtained by our lab and compressed for use on handheld computers. Menus were created in ArcPad to allow data collection. The GPS equipment used were classified as adequate for open terrain through studies conducted by the USFS but these units did not have the capability to differential correct data. Our experience has demonstrated that we are within 4 meters of the true position and often error is less than 2 meters. Our lab has made the decision to allow greater positional error while reducing detection error (employ more people to reduce the chance of missing plants rather than use more expensive units). In addition to handheld computers and GPS, the crews had radios to keep in contact. The following additional equipment is needed for remote points that could not be accessed but could be seen. The equipment includes a compass, a clinometer and a laser range finder. With this additional equipment we can log a remote point and position it properly in the GIS lab.

Data Description

Plant name, plant code obtained from USDA-PLANTS database, cover, density, disturbance, date and surveyor were collected for each infestation.

PLANT CODE: This is a required 4-5 space combined character and numeric field that follows the coding system used by the NRCS PLANTS database. This database can be found at http://plants.usda.gov/plants/index.html. Plant codes are useful tools for recording plant names in the field and for use in databases. Since there are several types of plant codes, those identified in the PLANTS database will be used to standardize the entry of codes region-wide. Appendix 3 identifies noxious weeds by state and their associated PLANTS database code.

INFESTED AREA: This is a required data element that refers to the actual or estimated area of land (acres or hectares) occupied by a single weed species. An infested area is defined by drawing a line around the actual perimeter of the canopy cover of the weed plants, excluding areas that are not infested or through an estimation of an individual species occupancy within a gross area (see below). This data element is divided into two data fields. The first field is a numeric value reflecting a conversion of the percent canopy cover into infested area (see canopy cover definition below) and the second field is a character field that identifies the unit of measure used (e.g. acres or hectares). Infested area can be reported as low as 0.01 acre or 0.004 hectares.

A value for infested area is required regardless of whether the perimeter of an infestation for a species is an actual measurement or an estimated value from the gross area. Areas of land containing only occasional weed plants do not equal an acre of infestation. By measuring or more closely estimating the actual area infested by a weed species, individual parks, networks, and the PWR will become much better equipped to define a truer picture of "acres of infestation" by weeds. This will greatly enhance the efficacy of setting weed management priorities and in communicating appropriate resource needs. Examples 1 and 2 below the explanation of "canopy cover" help to illustrate the use of infested area, gross area, and canopy cover.

This is the data element that will be used to sum and report weed acres occurring within parks in the PWR.

CANOPY COVER: This is a required 1-3 digit numeric field that is defined as the percent of the ground covered by foliage of a specified weed species within the perimeter of the area identified for measurement. Canopy cover can be an actual measurement (e.g. recorded foliage perimeter with a GPS unit) or can be an estimated value (e.g. actual ocular estimate of cover or an identified cover class) in situations where an actual measurement is not feasible. Actual measurements are preferred (e.g. GPS perimeter of weed population), however, in cases where a park may already be using cover classes to estimate cover by a weed species, then either the mid-point of the chosen cover class should be entered into this data field or an actual ocular estimate. A second character data

field that identifies whether the data value entered is either actual or estimated should be established with this data element.

DENSITY OF STEMS – within each polygon it is important to document some type of stem density assessment in addition to canopy cover. This assessment can be qualitative (required) and simply note if stem density is low (1-3 stems/sq meter), moderate (4-7 stems/sq. meter), or high (>7 stems/sq. meter) or can reflect an actual quantitative measurement (optional)

DISTURBANCE (HISTORIC & CURRENT): This is an optional 4-7 letter character field that allows the investigator to identify up to 5 primary causes of historic and/or current disturbance factors that may be affecting the current vegetation composition of a site.

AG/GRAZ Agriculture/Livestock Grazing
IRRGAT Irrigation/Ditching
CON/DEV Construction/Development
MINING Mining/Quarries
OIL/GAS Oil/Gas Development/Production
WLDFIRE Wildfire
FLOOD Flooding
FIRESUP Fire Suppression
REC/VIS Recreation/Visitor Use
WIND Wind Disturbance/Erosion
GEOTHRM Geothermal
RGHTWAY Right-of-Way
ANMLDIS Animal Disturbance
UTILITY Utility Corridor
HABPROJ Habitat Improvement Project
RD/ORVU maintained road/ORV use

Survey Method

The survey was conducted by lining out the crew along travel routes at twice the distance the crew felt comfortable making an identification for the species they were looking for. The crew would then walk along the travel route until they found plants. At that point they would survey away from the plant to a distance of 0.25 miles for species whose seeds are not wind-borne and to a distance of 0.5 miles for species whose seeds are wind-borne (Figure 1). The green line in Figure 1 would be a radius of a circle drawn from the plant that was found. Any plant found within that radius would then force an outward expansion of the circle. A crew should consist of at least 3 people to minimize the chance of missing plants. The chance of missing plants goes down as the survey crew number increases. We think a crew of 4 people is ideal because logistically their gear fits within a vehicle and when instances where the crew needs to split up, the crew is easily paired.

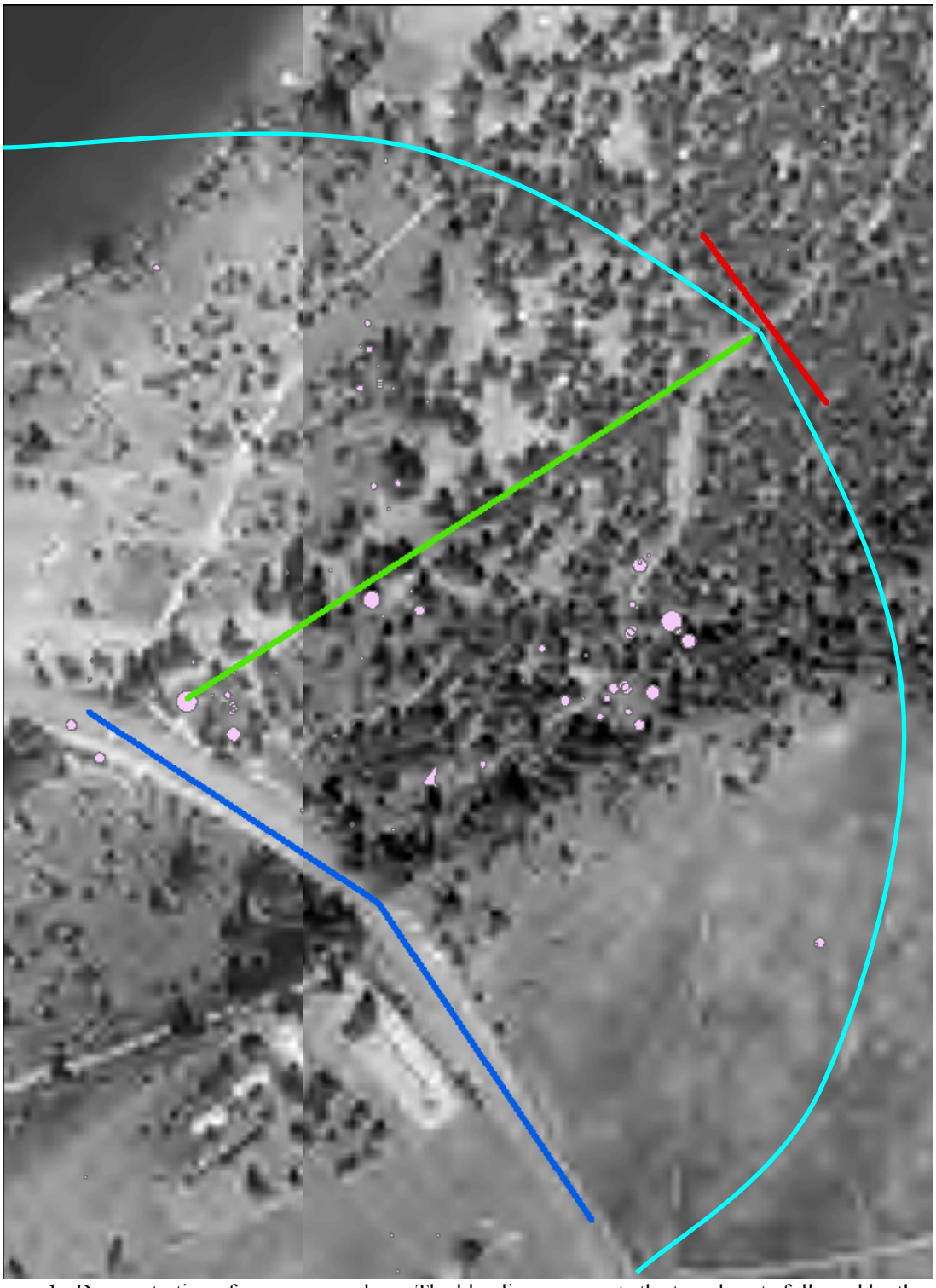

Figure 1. Demonstration of survey procedure. The blue line represents the travel route followed by the crew. The green line is the distance the crew would travel from that specific plant whose endpoint is represented by the red line. Since additional plants are found along the green line, the red line would continue to move to the right of the image so that there would be no plants found along a green line drawn from the outermost point. The light blue line designates the perimeter surveyed considering the first plant found, the circle expands in the direction where additional plants are found.

Results

A total of 790 acres were surveyed within City of Rocks National Reserve (Table 1). The acres surveyed represented sites targeted for survey and do not encompass the entire park (Table 1). Field bindweed was the most widely distributed species. Most species were located on fewer than 5 acres. Of the species with greater than 1 acre total infested, salt cedar is by far the biggest concern and should be targeted for removal. All species recorded with less than 1 acre are good candidates for complete removal using eradication as the method of control.

Eradication can be achieved by performing a delineation survey to find the outer boundary of each infestation, controlling the species with herbicide, following with a post application monitoring survey, and finally, following with additional treatment and monitoring surveys as necessary. Eradication costs rise exponentially with increasing area infested so eradication of infestations of less than an acre is cost effective, often costing hundreds of dollars to several thousand dollars. When individual infestations exceed 100 acres, the likelihood of success is decreased and costs are considerably higher, and can approach hundreds of thousands of dollars.

Species with greater than 5 acres should be contained. These infestations should have the outer edges sprayed so that the chance of new infestations developing is minimized. Infestations that are obvious sources for dispersal, such as infestations at trail heads or at camping areas, should be controlled so that seed dispersal is minimized. Biological control can also be used in a containment program for species not slated for removal like musk thistle, although with the small acreage it may be better to spray it.

Other sections of the park should be surveyed in a second year to build a comprehensive inventory. With a survey completed, a comprehensive strategy could be outlined. However, treatment should not wait for a completed survey. Studies have shown the cost of waiting exceeds the benefit of waiting to obtain a better strategy. The strategy outlined should be pursued next year to begin the process of reducing the area infested. Once the survey is complete and a strategic management plan is in place, then a monitoring plan to track success should be developed at the conclusion of year two and implemented in year three. In addition, after the second year a detection survey plan could be developed to determine entry points where new invaders would first enter the recreation area so that future detection survey efforts could be focused to those areas.

Table 1. Plant species targeted for survey, area infested by these targeted species, and level of concern. The level of concern was determined by a combination of the number of acres found and the species potential to modify the environment at City of Rocks. A total of 38 acres were infested and 790 acres were surveyed within the park. Three additional species were slated for survey but were not found in the areas surveyed and included: poison hemlock, yellow toadflax, and dyer's woad.

Species	**Area (acres)**	**Level of Concern**
Black Henbane	0.090617557	Low
Bull Thistle	6.661526109	Low
Canada Thistle	14.5176266	Medium
Chicory	0.033371265	Medium
Field Bindweed	8.381648588	Medium
Houndstongue	0	High
Musk Thistle	0.089739959	High
Salt cedar	3.140921	Very High
Scotch Thistle	0.001552277	High
Spotted Knapweed	0.11644503	High
Sulfur Cinquefoil	4.715868051	High
Wavyleaf Thistle	0.01086528	High